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second-hand imitation of nature. If he would be original, he must study the volume which nature herself has unrolled before him.

ART. IX.—*Habits of Insects.*

Insect Architecture. Insect Transformations. Insect Miscellanies. London. 1831.

We never have had the honor of an intimacy with our fellow-creatures of the insect race ; and have occasionally found their personal attentions so troublesome, that we should have been willing to drop their acquaintance altogether. Since this may not be, and we must tolerate them, whether we like their company or not, we feel grateful to those, who by their patient and searching investigations, discover the habits and characters of these creatures, which, though they have much to reward attention, have but few attractions to invite it. We can understand the passion which leads such men as Audubon and Nuttall to encounter the evils of solitude, hardship, and privation, and to feel well rewarded by the discovery of a new bird or flower, better than the self-devotion of such men as Réaumur to the study of the insect race, the greater proportion of which seem like an unlovely rabble, having few claims upon the gratitude or affection of man. But our hasty impressions on this subject, as well as most others, would mislead us ; for these philosophers have opened golden mines of discovery in this unpromising soil, and unfolded some of the most striking evidences of divine wisdom ever presented to man, in this part of the creation, on which many will not dare or deign to look. They have not labored, however, wholly without reward ; for the curious facts, made known by Huber and many others, have awakened a general interest in the subject ; it is now embraced within the demands of education ; it is used also by friends to human improvement, to inspire a general thirst for knowledge, which, once inspired, easily directs itself to the channels in which it can move to most advantage. It is important to take care, that the popular demand for information shall be well supplied. There is some cause to apprehend, that popular works shall be manufactured for the booksellers, which, like the broth sometimes provided for the poor in cities in seasons of famine, shall answer the double purpose of satisfying their hunger for

the present, and removing all temptation they might have to apply again.

These works, however, are not of a description to strengthen these fears. They appear to have been prepared for the Library of Entertaining Knowledge, by the English naturalist, Mr. Rennie, whose reputation is generally known. His favorite maxim is, that Natural History must be studied, not in human abridgements and compilations, but in the great book of Nature. This plan of field-study requires, to be sure, more earnestness and diligence than every one possesses; it is not every one, either, who has leisure or advantages of situation for pursuing it; still he is doubtless right in saying, that the study of books is apt to be a study of *words* and not of *things*, and that a few facts, learned from personal observation, will inspire more interest and enthusiasm, than the study of books for years. His remarks probably are meant to point out the proper education for a naturalist,—for one who is to enter deeply into the subject; but the great majority of readers, while they do not wish to be wholly uninformed, must, from the necessity of the case, take the observations of others upon trust. They will easily persuade themselves to submit to this necessity, if all the authorities upon which they are compelled to rely, are as entertaining and instructive as the author of the works before us.

We observe that Mr. Rennie, like other entomologists, Linnæus among the rest, has thought it necessary to maintain the dignity of the study. There is no great necessity for filing this protest against the common feeling, which arises from ignorance, and disappears as fast as the means of making themselves acquainted with this subject have been offered to the world. There is something sufficiently comic in seeing a man holding forth, with the eloquence of Cicero, upon the wonders and beauties of an insect's wing; we are struck with the physical disproportion between the investigator and his subject; but we do not doubt, all the while, that he has found something fully worthy the attention of an enlightened mind; there are smiles which are perfectly consistent with respect, and playful satire with which no one needs feel insulted. There is no great malice in such ridicule as this, and it is rather forbearing than otherwise, when it is considered what language the enthusiasts in the science have sometimes used. One of the most distinguished among them was so lost in

rapture at contemplating the evolutions of a party of insects upon the wing, that they reminded him of nothing less than seraphs and sons of light, shining in the glories of their heavenly state ; a comparison quite too lofty for the occasion, and one which the most ambitious insect would confess was quite beyond his pretensions. Apart from the disposition which men have to exalt their favorite pursuit, it is well known that the spirit of philosophical investigation, whether it directs itself to beast, bird, or flower, or, as is generally the case, includes them all, is one which is seldom found, except in enlightened and active minds. It affords to such minds a pursuit, in its lower stages harmless and happy, and in its higher efforts requiring intellectual exertion sufficient to recommend it to great men, as a field in which their powers may be worthily and religiously employed.

The advantage of supplying means of happiness to men is not generally understood ; and yet, in ordinary circumstances, whatever makes men happier makes them better ; a fact which has hitherto been strangely overlooked by moralists, but now begins to be regarded as one of the most important principles of moral reform by those who would root out prevailing vices, and supply men with those inducements and encouragements, without which they will do nothing even for their own welfare. Most men are driven to lawless pleasure by vacancy of mind,—by the torture of a mind, preying upon itself for want of foreign materials to act upon ; and as learning has been regarded as quite beyond the common reach, none but minds highly cultivated, or very energetic by nature, have been able to find a sufficient number of worthy objects to engage them. Action is as important to the mind, as it was to eloquence in the opinion of the great master of the art ; action the mind must have, right or wrong ; it is well if it can find ways in which its activity may be exerted without running to waste or bringing injury to itself or others, and whoever points out such ways, not to the enlightened few only, but makes them so plain, that all the world can see them, deserves to be regarded as the greatest reformer of popular vices, because he destroys the root of the evil, while others have been laboring without success upon the branches, which spring again with new vigor, as fast as they are hewn away. Even when the mind is most inactive, an action, though not voluntary, is going on in it, which tends fast to its injury and corruption ; its calm, like

that of the waters, if it endure for any length of time, becomes stagnation; and this is a danger to which men are the more exposed, because the mind never seems so rapt, so absorbed in meditation, as when it is thinking of nothing at all. Cowper has well described the solemn aspect of the dreamer, gazing upon the evening fire, looking as if he were deliberating upon the fate of nations, while nothing that deserves to be honored with the name of a thought, passes through his mind for hours together. So, too, in a solitary walk, which is generally supposed to be so favorable to thought, the mind gives itself up to reverie, without exerting itself to any good purpose. Now, if the naturalist can make men attentive and observant,—if he can make them note the construction and contrivances of insects, in which instinct seems sometimes to surpass intelligence in the skill and success of its operations,—if he can make them regard the beauty of the delicate flower, which they used to crush beneath their feet, or induce them to listen to the song and observe the plumage of the bird, which formerly, if not a ‘good shot,’ was nothing to them,—he will afford to them a never-failing source of enjoyment, and secure to his favorite sciences the benefit of many useful facts and observations.

Insects are now a formidable body, and were much more so in former times, when their habits and persons were less familiarly known. Men had not begun to ask whence they came, nor whither they were going; but they found them when they least desired their company, and there was a sort of mystery in their movements, which, more than any thing else, tends to inspire the feeling of dread. It was on this account that they were first distinguished by the name of *bug*, which, however it may have degenerated into a watchword of contempt at the present day, was formerly synonymous with ghost or spectre, and equally alarming. The passage of scripture from the Psalms, ‘Thou shalt not be afraid of any bug by night,’ as it stood in Matthews’s old English Bible, is probably known to our readers. Later translators have judiciously substituted a more general word in its stead. But even now, considering their power to destroy our peace, there is some reason to fear them, and were there nothing else formidable about them, their numbers are sufficiently alarming. When we hear their concert on a summer evening, it sounds as if every leaf and every blade of grass had found a voice; though, in fact, there is no voice in the matter. They deal

wholly in instrumental music ; some have heard a voice-like sound proceeding from a moth occasionally, but their concert,—great nature's hum,—is produced by rubbing the hard shells of the wings against the trunk or together, which makes a sharp and shrill sound, that can be heard at a considerable distance. The hum of insects on the wing can be heard when the performer is invisible. We remember, that once standing in a summer day on the top of a high hill, we heard a sound as of a million bees directly over our head, when not an insect, which could be held responsible for any noise, was within our view. Such cases are not uncommon, and the only explanation is, that the authors of the sound are distant, and its loudness deceives us into the impression that it is nigh.

We will suggest some advantages of an acquaintance with this subject ; we mean a general acquaintance, such as popular works are calculated to give. For example, the insect called the death-watch was formerly thought to sound an alarm of death to some inmate of the mansion where it was heard, though it would have required a perpetual cholera to have fulfilled half the number of his predictions. Now, it is known to proceed from a little wood-boring insect, whose skull is somewhat hard, and who uses it for the purpose of a signal to others. Standing on its hind legs, it beats regularly on the board a number of times,—a process, which, comparing its force with the size of the insect, one would think more likely to be fatal to itself than to those who hear it. The bug, so well known in connexion with 'rosy dreams and slumbers light,' when it was first imported into England, occasioned equal dismay,—an alarm not wholly superstitious and unreasonable, when we remember how often it has 'murdered the sleep' of the innocent as well as the guilty. If we may believe David Deans, the Scotch bewail its introduction among them as one of the evils of the Union, and for that reason distinguish it by the name of the English bug. The history of the Hessian fly, which made its appearance at the close of the American war, and which certain aged people, believing it to be a consequence of our separation from the British Government, named the Revolution fly, shows how much alarm and trouble ignorance of the character of a little insect may occasion. They first appeared in Staten Island, and spread rapidly, destroying the wheat upon their way. They passed the Delaware in clouds, and swarmed like the flies of Egypt, in every place where

their presence was unwelcome. The British, naturally disliking every thing that savored of revolution, were in great fear lest they should reach their island, and resolved to prevent it, if necessary, with all the power of their fleet. The privy council sat day after day; despatches were sent to all the foreign ministers; expresses were sent to the custom-houses to close the ports; Sir Joseph Banks, who held such matters in special charge,—as Swift said Mr. Flamstead was once appointed by Government to look after the stars,—was called upon to exert himself, with such importunity, that if such a thing were possible, he grew almost profane upon the occasion. He shouted across the ocean to Dr. Mitchell, while the Doctor stood wringing his hands upon the western shore. When he had collected all the information which could be furnished by scientific and practical men concerning the bug in question, amounting to more than two hundred octavo pages, he enlightened the Government with the information, that he did not know what the creature was; a report satisfactory as far as it went, no doubt, but which might, for aught that appears, have been reduced to somewhat smaller dimensions. If any one could have furnished a scientific description of the insect, it might have been probably arrested in its depredations, and if not, there would have been some consolation to men, could they have pointed it out to the indignation and scorn of the world.

Our cultivators can furnish illustrations enough of the evils of ignorance on this subject. The common locust, *robinia pseudacacia*, whose velvet leaf exceeds other foliage in beauty, as much as its wood exceeds that of other trees in value, is almost ruined in New-England by the larva of a moth, which is known to naturalists, but which no means have yet been able to destroy. We know that in plantations lately made, the ravages of the insect have been confined to their sunny borders; but we greatly fear, that in a year or two, they will carry their inroads into the heart of the groves. Certainly, the fine trees of this description which fringe the highways and surround the cottages, must be given up to this little pest, which, so far as we know at present, will only cease from its labors on condition of being cut in two. The cankerworm, too, is waging a war of extermination upon our fruit trees. After passing the winter in the ground,—would that it were its grave,—the insect makes over the tree to its heirs, which can only, with our present knowledge, be checked by means, that like curing

the head-ache by amputation, are too effectual for the end proposed. Pear orchards resemble the gardens of the French nobleman, mentioned by Madame de Staël, which were planted with dead trees in order to inspire contemplation ; not knowing enough of the borer to be able to bring him to justice, the cultivator can only sigh over his more than lost labors. But for Dr. Franklin, it would have been more common than it is now, and the practice is by no means obsolete, for every family to supply itself with moschettoes by keeping large open vessels of water near their houses, as if for the special benefit of this insect, whose bark and bite are equally undesirable. The moschetto lays its eggs upon the water, where they are hatched into grubs, which float with their heads downward ; when the time for their change is come, they break through their outer covering and draw themselves out standing upright, so that they appear like a vessel, the corslet being the boat, and the body officiating as mast and sail. Their former sea-change is now reversed ; for, should their naval establishment overset, they are inevitably lost moschettoes. As soon as their wings are dried, they fly away to their work of blood. As six or seven generations are born in a summer, and each mother can furnish two hundred and fifty eggs, it is evident that a vessel of water, properly neglected, will people the air of a whole neighborhood. But there is no end to the list of evils, arising from ignorance on this subject. One of the choicest specimens of it we have ever heard, is that of gardeners in Germany, who collect and bury grubs in order to destroy them, a mode of destruction quite as fatal, as that of throwing fish into the water to drown them.

It would be easy to give some striking illustrations of the advantages of knowledge on this subject. The manner in which peach trees are secured from the depredations of the insect which every year destroys many, is familiarly known. The insect deposits its eggs in the bark of the tree, as nearly as possible to the surface of the ground. When it is obliged to resort to the branches, besides that it is more easily discovered by the gum which flows from the wound, the grub would generally be arrested by the cold before it could make its way to the root, where it retreats in winter. By ascertaining the time when these eggs are laid, and tying straw or matting round the trunk of the tree, its injuries are easily prevented. We are persuaded that the ravages of the clothes-moth, the creature to whom food and raiment are one, might be prevented by

exposing clothes to the light at the time of oviposition. When the timber was found to be perishing in the dock-yards of Sweden, the king applied to Linnæus to discover a remedy, thus acknowledging the dependence of commerce, national defence, and royal power, upon humble scientific researches. He ascertained the time when the insect deposited its eggs, and by sinking the timber in water at that period, the evil was effectually prevented.

We certainly receive many serious injuries at the hands of the insect race. But they are not wholly unprovoked; nor can it be denied, that if they torment us, we also torment them. It is to be hoped that the time will come, when we shall be able to deal with them as with larger animals, exterminating those which cannot be employed in the service of man. At present, however, their ingenuity, their perseverance, and their numbers, render it hopeless for man to make any general crusade against them. But we have little to complain of, compared with the inhabitants of warmer climates. Dr. Clarke tells us, that in the Crimea he found the moschettoes so venomous, that in spite of gloves, and every other defence, he was one entire wound. In a sultry night, he sought shelter in his carriage; they followed him there, and when he attempted to light a candle, they extinguished it by their numbers. In South America, there are countless varieties; some pursue their labors by day, and others by night; they form different strata in the air, and new detachments relieve guard as fast as the former are exhausted. Humboldt tells us, that near Rio Unare, the wretched inhabitants bury themselves in the sand, all excepting the head, in order to sleep; we should think that, in such a condition, they would be sorely tempted to make no exception. Even this is not so great an evil as the destruction made by the white ants among papers of all descriptions. The same authority mentions, that there are no documents of any antiquity spared by this destroyer; it invades the tenure of property, the duration of literature, the record of history, and all the means of existence and improvement, by which civil society is held together. It is melancholy enough to see gardens, fields, and forests sinking into dust; but we must confess that this last calamity quite exceeds all others.

Millions of insects infest our gardens. The plant-lice cover the leaves and draw out their juices, so that they wither and fall. The ants compel these aphides to give up to them what

they have plundered from the tree. These insects, the aphides, are so small, that they would seem to have no great power to do harm; still, as there are twenty generations in a year, 'the son can finish what his short-lived sire begun.' Our ornamental plants thus lose all their beauty; tortrices roll up their leaves; leaf-cutter bees shear out their patterns; and the mysterious rose-bugs pour in numbers faster than man can destroy them, in the proportion of ten to one. The honey-dew, which formerly occasioned so much speculation, concerning which Pliny could not say positively, whether it was the sweat of heaven or the saliva of the stars, is now known to be the secretion of an insect, instead of falling from the skies. If man had sense enough to prevent the destruction of birds, there might be less reason to complain that the labors of the garden are so often rewarded with no more substantial result than vanity and vexation.

The animals in our service suffer even more from insects than ourselves, and nothing effectual can be done to prevent it. After the horse has been irritated almost to madness by the fly, the *tabanus* (horse-fly) comes to bleed him, as if to prevent the effects of his passion. This service is rendered the horse sorely against his will; but he fears nothing so much as the horse-bee; the animal is violently agitated, when one of these is near him; if he be in the pasture, he gallops away to the water, where his persecutor dares not follow him. Every rider knows what a desperate enemy he has in the forest-fly, a creature difficult to kill, though it holds life in so light esteem, that it prefers death to quitting its hold. An insect similar to the horse-bee takes the ox under his special keeping, piercing him with an auger of very curious construction. But it is needless to mention particulars of this kind; it is enough to say, that there is no domestic beast or fowl which is not tormented by some kind of insect, and generally, more than one. The abodes of pigeons are always haunted by that ominous bug, which is such an enemy to the rest of man. But among these various injuries offered to man, and the animals under his protection,—to whom his protection in this instance does but little good,—there are some examples of forbearance on the part of insects which deserve to be mentioned, as equally gratifying and unexpected. The insect which lays its eggs in peas, deposits them, so that the grub may feed upon the pea after it ripens; the grub feeds accordingly, but shows such discretion in its operations as not to injure the germ, even when it eats

the pea to a shell. The caterpillars, also, which eat the leaves of the tree, spare the bud, so that its growth is not seriously injured. It may be well to mention with respect to the former insect, that its presence is not always seen in the peas which it inhabits, so that those who eat dried peas, which are not split, may be gratified to learn, that they secure a large proportion of animal, where they paid only for vegetable food.

It is not necessary to go out of the house to learn the injuries which insects inflict on man, who, if he be the lord of creation, has some refractory subjects, and some which utterly defy his power. A great proportion of these domestic inmates have no Christian names; whoever speaks of them, is obliged to resort to the learned nomenclature. Flour and meal are eaten by the grub of *tenebrio molitor*; he will not give us the trouble of making it into bread for him, though it is very acceptable to him after it has passed through the process of baking. The *acar*us *farinæ*, more moderate in his demands, is content to feed on old or damaged flour. The *dermestes paniceus* leads a seafaring life, solely for the luxury of feeding upon sea-biscuit; the more hearty grubs of *dermestes* and *tenebrio lardarius* can live upon no lighter food than dried meats and bacon. Fresh meat, however, is always in demand, not only by the flesh-fly, but the wasp and hornet; and all these have a sweet tooth, and make a practice of eating large quantities of sugar. Butter and lard are eaten by *crambus pinguinalis*; the cheese-maggot, so renowned for his unexampled powers of still-vaulting, lives upon new cheese; but the more epicurean *acar*us *siro* will not touch it till it is mouldy. The *musca cellaris* drinks our vinegar, while the *oinopota cellaris*, strong in the cause of temperance, rejects ardent spirits, and drinks nothing but wine.

There are some valetudinarian bugs, which consume large quantities of drugs and medicines, though, so far as we can learn, their custom is little in request by the apothecaries. The *sinodendrum pusillum* takes rhubarb; there is a kind of beetle which eats musk, and the white ants are well known to be in the bad habit of chewing opium. Some are fond of dress. The clothes-moth is so retired in its habits, that we know little concerning it, except that it eats our clothes in summer. The *tapetzella* feeds on the lining of carriages; the *pellionella* chooses furs, and shaves them clean; the *melonella* eats wax, and in seasons of scarcity submits to eat leather or paper. There are hundreds which live on wood; one of which, a

cerambyx, after eating through the wooden roof, forces his way through the lead. Some have a literary turn. The *crambus pinguinalis*, like some literary gentlemen, regards books only with an eye to the binding. Another, called the learned mite, *acarus eruditus*, eats the paste that fastens the paper over the edges of the binding. Another, whose name we have never learned, gets between the leaves and devours them; while the *anobium*, an industrious little beetle, determined to make himself thoroughly acquainted with the contents of the work, goes quietly from the beginning to the end. We are told that one of them, in a public library in France, went through twenty-seven volumes in a straight line, so that on passing a cord through, the whole were lifted at once. The beetle deserved credit for this remarkable exploit, being probably the only living creature who had ever gone through the book.

To those who resent these injuries, it may be consoling to know, that the means of ample vengeance are within their reach, and if they choose to follow the example of those who kill and eat insects, the insects will certainly have the worst of the war. The Arabs, as is well known, eat locusts with great relish, though for reasons not certainly founded upon the disparity of outward favor, they look with abhorrence upon crabs and lobsters. The Hottentots also delight to have locusts make their appearance, though they eat every green thing, calculating with some foresight, that as they shall eat the locusts, they shall not be losers in the long run. This people, who are far from fastidious in any of their habits, also eat ants boiled, raw, or roasted after the manner of coffee; and those who can overcome the force of prejudice, so far as to try the experiment, confess that they are extremely good eating. Kirby, the English naturalist, bears testimony to this effect. Smeathman says, 'I have eaten them dressed in this way, and think them delicate, nourishing, and wholesome; they are something sweeter, though not so cloying, as the maggot of the palm-tree snout beetle, which is served up at the tables of the West Indian epicures, particularly the French, as one of the greatest luxuries of the country.'* In parts of Europe, the

* A learned foreigner, with whom we lately conversed upon the subject, gave us the following account of his method of treating these insects. Whenever in his walks he meets with an ant-hill, he immediately approaches it with the end of his walking-stick. The ants come out in great numbers, some to reconnoitre, and some for the mere

grubs of some of the beetles are highly esteemed ; the *cerambyx* is the delight of the blacks in the Islands ; the inhabitants of New Caledonia are partial to spiders. *Equidem non invidéo, miror magis*. It is highly probable, that a large proportion of insects were intended by Providence for food ; and if we will not eat them, it is unreasonable to complain of their numbers.

Having said so much of the injuries occasioned by insects, lest we should excite too strong a prejudice against them, a prejudice which they have no personal attractions to balance or remove, it becomes a duty to mention some benefits, for which we are indebted to them. The list of these benefits is large already, and scientific research, aided by popular curiosity, will before many years extend it much beyond its present bounds. It will be a happy day for the insects, when their good qualities are known. The bee that sails with so much airy independence through our gardens, perfectly satisfied that they were planted for its benefit alone, would find little protection in its familiar manners and brilliant dress, were it not able to lay man under obligations. The silk-worm, which is now cherished with so much care, would be rejected with disgust, like other caterpillars of the garden, were it not able to pay for protection by its labor. Those that depend upon the charity of man, find but little quarter ; it is in vain that Shakspeare assures us, that the pain of the trampled insect equals that of the suffering giant ; in vain that Cowper implores us not needlessly to crush a worm : unless they can make it for man's interest to protect them, they have little forbearance to hope for ; the man of science, therefore, who discovers and points out their uses, is certainly a friend to the bugs.

Generally speaking, insects do the duty of scavengers. In our climate, they are useful in this capacity ; but their labors here are nothing, compared with their exploits in warmer countries, which, if they are uncomfortable with them, would be uninhabitable without them. Whenever a carcase falls in our climate, the insects move to it in air lines ; beetles of all descriptions, wasps, hornets, and flies, lay aside all minor differences, and engage in the work of removing it. The flesh-fly deposits in it its grub, already hatched, that it may lose no time ; and as this last named insect has a promising family,—

pleasure of the excursion. When the stick is pretty well covered with them, he draws it through his lips and secures them all. He describes the taste as cool and sourish, not unlike that of the plant sorrel.

a single parent producing more than twenty thousand young, which eat so plentifully as to add two hundred fold to their weight in twenty-four hours,—the nuisance is soon abated. In warmer countries, this operation is carried on with miraculous expedition; before the air can be tainted by the savor of corruption, the flesh is removed, and nothing remains but the bones whitening in the sun. They do a still greater service to men in removing dead vegetable matter. They generally prefer animal food; but as they are not able to procure it oftener than an Irish peasant, they all, moschettoes among the rest, content themselves with vegetable substances. Great numbers of the flesh-fly are imposed upon by plants similar to the skunk cabbage; supposing, from their peculiar fragrance, that they are flesh in that particular state of decay, which epicures delight in, the insects deposit their eggs upon them, and when the young are hatched they discover the mistake, quite too late to repair it. Réaumur thinks that we are indebted to this fly, for making it a point of conscience not to eat the flesh of living animals;—he tried the experiment, and found that they unanimously refused to touch the flesh of a living pigeon. It is a pity, that naturalists should not learn humanity from so excellent an example.

It is not necessary to explain to our readers, that we are indebted to insects for silk and honey; the latter having been used from the earliest ages, and the former promising to be used as extensively in our country before many years. It is fully ascertained that our climate is favorable to the silk-worm, and to the plant on which it lives; and it is not the habit of our countrymen to neglect any opportunity of securing comfort or gain; on the contrary, they are more in need of learning from the insects their judicious habit of dividing labor; for the moment a channel of adventure is opened, they rush into it with a force which sometimes carries them far beyond the end proposed. Here is a constant disposition to bite the chains of nature; and as he who ascends a staircase in the dark, if when he has reached the top he attempts to go higher, meets with a painful sensation of disappointment, so do many of our countrymen injure themselves by attempting to draw from their chosen pursuit, more than nature ever intended it to give. There is no question, that the manufacture of silk will be greatly and rapidly extended; and the result will be not to increase luxury, but to change what is now a luxury into a necessary

of life. Time was, when stockings were a luxury ; now they are worn by the beggars of our country. It is upon record, that a king borrowed a pair of silk stockings for a public occasion ; here, they may be found in the possession of those, who, unlike the lilies of the field, both toil and spin.

We are indebted to insects for the ink-powder, an article important in all professions, but indispensable in ours. It is formed by a *cynips* on the *quercus infectoria*, a sort of shrub-oak which grows in Asia and Africa, whence the galls are constantly exported. The insect bores the bark and deposits an egg. It is generally thought to insert some corrosive fluid with it, which, as the sap flows out from the wound, gives its color and properties to the gall, that grows and swells round the egg for the young insect's future home. There is some difference of opinion as to this process. Mr. Rennie suggests, that the egg may be protected or coated with gluten, which prevents the escape of the sap ; the sap, thus confined, pushes out the pellicle of gluten that covers it, till the opening is closed by being hardened in the air. This will account for the uniform size of these productions. The galls of the rose and willow are well known ; the gall of commerce is as large as a marble. This furnishes a comfortable dwelling for the young insect, and a dye for those streams of ink which are perpetually flowing in the civilized world, for libel or literature, for evil or good. They are also used in dying ; those which contain the insect being called blue gall-nuts, those which it has abandoned, white. An insect inhabitant of the oak, *coccus ilicis*, was formerly used in dying red. In modern times, cochineal, *coccus cacti*, is generally used. The Spaniards found it employed by the Americans, when they came over to this country. It was supposed to be a vegetable production, and it was not till a period comparatively late, discovered to be a living thing. It feeds on the nopal, a kind of fig-tree common in New Spain and some parts of India. The inhabitants preserve them in their houses through the rainy season, and when it is over place them upon the tree, which they soon cover. They are after a time brushed from the tree with the tail of a squirrel, and being killed either by artificial heat or exposure to the sun, the inside is found filled with the red dust, which forms this splendid color. So important is this article in commerce, that the East India Company offered a reward of six thousand pounds to any one who should succeed in naturalizing it in their territories. Another insect

of this description carries on a manufacture of unexampled extent and variety, being actually employed in supplying the demands of the world for shellac, beads, sealing-wax, lake, lacquer, and grindstones. The insect covers trees of the fig kind in Hindostan, in such a manner that their upper branches look as if they had been dipped in blood. The substance in its natural state, before it is separated from the twig, is called sticklac, from which all the others are made. After being separated, pounded, and having the color extracted by water, it is called seedlac; when melted into cakes, it is called lump lac; when purified and transparent, it is the shellac, which is so extensively used. It is used by the natives to make rings, necklaces, and bracelets; mixed with cinnabar, it is formed into sealing-wax; heated and mingled with a black powder, it forms a lacquer, or japan; and the coloring substance extracted from the sticklac is the lake of our painters. Last, but not least, of its uses, it is mixed up with river sand and moulded into grindstones. Truly, it is no easy matter to name the creature, which answers such a variety of purposes as this.

Réaumur undertook the benevolent enterprise of civilizing spiders, by way of turning them into operatives, and thereby bringing them into better odor with man; but his good purpose was disappointed; for though they fully proved that they were able to work, they had an unfortunate propensity for eating each other, which proved to be inconsistent with the virtues and charities of industrious and social life. Their powers as artisans were very respectable, but no inducement could be brought to bear upon them; as for working for a living, it was the last thing they thought of; for some of them lived a year without tasting food, or seeming in the least exhausted by fasting. This indifference to common wants, is one of the most remarkable things in the character of the race; they never seem to repine under any degree of pain or privation. They are probably mortal, but it seems sometimes almost impossible to kill them. Bees will live many hours under water; caterpillars are frozen up through the winter, and bear it with the utmost composure. Dr. Dwight tells us of a beetle which was planed out of a table where he had resided, if we remember rightly, eighty years without a dinner. Dr. Arnold once had an insect, which, after the tender-hearted manner of collectors, was pinned down to a table; some other insects happening to be within reach, it proceeded to eat them with as good an ap-

petite as ever it had in its life. Some beetles have been soaked in boiling water, without being oppressed by the heat. Many insects have a way of pretending to be dead, as a sort of hint to man, that if, as usual, he is disposed to kill them, he may spare himself the trouble. If any one is disposed to ascertain whether their death is counterfeited or not, they will not flinch, even when torn asunder, or thrown on burning coals. Some, even when cut in two, retain the easy indifference which they manifest on most other occasions. Many of our readers have probably seen ants cut from a hollow tree in spring, and though they must have passed many months without food, regain their cheerfulness in the sun. The ant, however, is torpid through the colder parts of the winter. Our ants, though, like those of Scripture, they are models of industry, have not the forethought to provide for the winter. But it may be that in warmer climates they have this prudent habit, for which they have been so long held out as an example.

It is fair to say, that in cases where insects are troublesome, they are sometimes less injurious than is supposed, and the blame does not invariably fall on the one that deserves it. It is thought that the irritating insects, particularly those that draw blood from domestic animals in summer, are necessary to their health,—to save them from the diseases which would be otherwise occasioned by heat and repletion. In the household, too, it is no misfortune that they enforce the duty of perpetual cleanliness, and it is well known that, as in the case of moschettoes, a little attention may reduce the number and inconvenience of their visitations. We are told,—and it may be well to mention it in this connexion,—that the house-fly does not, as is commonly supposed, abuse the familiarity which man allows him. He is harmless and friendly in his disposition, and moreover cannot bite if he would. His proboscis is soft and sponge-like,—altogether unable to inflict a wound. This is the *musca domestica*; but there is another kind which exactly resembles him in person, except in having a sharp proboscis, with which he bites pretty seriously; he is known by the name of *stomoxys calcitrans*. This is not the only case, in which public resentment confounds the innocent with the guilty.

Our respect, if not our regard for insects, will be materially increased, if we consider some evidences and examples of their power. Happily they have not often a common interest sufficiently strong to organize them into parties or coalitions.

and, therefore, do not generally combine their forces to much effect ; but there have been cases in which they have made man tremble. We are told, that in ancient times, when Sapor, king of Persia, was besieging Nisibis, the light artillery of an army of moschettoes fell upon him with so much fury, that he raised the siege, and retreated with all possible expedition : but anciently they had so much faith in these things, that now we have very little ; still we have seen a man fly from the wrath of a bee, and we can conceive, that in this case, it is possible that the larger size of man may have been overborne by the numbers and valor of the moschettoes, and thus the battle have gone against the strong. But there are facts, modern and undoubted, which show how formidable insects can be. A small beetle has appeared regularly in the German forests ; in 1783, there were more than a million and a half of trees destroyed by them, and more than eighty thousand were counted in a single tree. We are told, by aged men, that many years ago, an insect made such ravages in the oaks of New England, that their case seemed as hopeless as that of the locusts is now. On the third year of their appearance, a heavy frost in May, which was very destructive to vegetation, put a period to the ravages of the insect, and it has not made its appearance in any force again. Wilson, the ornithologist, as quoted by Mr. Rennie, gives an account of the devastation made at the South by a small insect, which had hardly spared ten trees in a hundred on a tract of two thousand acres. ‘ Would it be believed,’ he says, ‘ that the larvæ of an insect no bigger than a grain of rice, should silently, and in one season, destroy some thousand acres of pine trees, many of them from two to three feet in diameter, and a hundred and fifty feet high ? In some places the whole woods, as far as you can see around you, are dead, stripped of the bark, their wintry looking arms and bare trunks bleaching in the sun, and tumbling in ruins before every blast.’ In the last century, an insect, *formica saccharivora*, attacked the sugar-cane plantations in the island of Granada, so fatally as to put an entire stop to cultivation. They covered the roads and fields ; they killed rats and mice by thousands ; when large fires were made to consume them, they crowded on till they extinguished them by their numbers. The whole crop was burnt and the ground dug up, but all to no purpose ; human power could do nothing. A reward of twenty thousand pounds was offered to any one

who would discover a remedy, but they were not even checked, till in 1780, they were destroyed by torrents of rain. Dobrizhoffer gives a curious account of the ants in Paraguay. He says, that they make burrows in the earth with infinite labor, under houses and larger buildings, forming large winding galleries in the ground. On the approach of rain, as if knowing what to expect, the ants take wing and fly away. The water rushes into their caverns, and undermining the building, it falls in total ruin. He mentions, that the ground, on which his church and house were built, was full of those caverns. For many days in rainy weather, the altar was rendered useless, for the ants flew out and fell upon the priests and every thing around. Ten outlets by which they escaped from the ground were closed, but the next day it was found that they had opened twice as many more. One evening there came a severe thunder-storm, in the midst of which the Indian, who had the care of the church, came to warn them that its walls were beginning to crack and lean; he snatched a lamp and ran to the place, but sunk up to the shoulders in a pit like a cellar, which, as soon as he was drawn out of it, he found was the house of the ants. As fast as the Indians shovelled earth into it, they dug it out. These are their greater exploits. Their ordinary employment is, to go in an endless procession to the place where grain is deposited, and to carry off bushels in a day or a moonlight night. They strip trees of their leaves, and reap fields as clean as the sickle. They will even attack men when sleeping, and unless they escape at once, cover them with their painful stings, and the only way of expelling them is by throwing lighted sheets of paper upon the swarm. This Jesuit was no naturalist; he once, as he tells us, pursued a skunk and succeeded in getting more explicit information from the animal itself concerning its own value and properties, than he could have wished, '*horrendo odore.*' He does not enlighten us as to the kind of ant, but says that they are the kings of Paraguay, and we doubt whether Dr. Francia has been able to subdue them.

The account of the white ants, or *termites*, was given to the world by Smeathman fifty years ago, and subsequent writers have added little to his information; the account, however, is sufficiently curious to bear repetition, since it affords the most remarkable example that can any where be found of admirable instinct, perseverance and power. Between the

tropics, they are the most formidable enemy man has to encounter, destroying papers, provisions, furniture, and every thing, even to house and home. Metal, glass and stone they do not eat ; why, does not appear, except it be from a principle of forbearance, equally touching and unexpected. They have been known to go up through one leg of a table and return down the other, in the course of a single night. An engineer, in the same space of time, had his clothes, papers, and the lead of pencils, which were all, as he thought, secured in a trunk, eaten by these destroyers. When they attack a house, they eat away the heart of the timber, leaving only the outer shell ; but, being well aware that this process would soon bring the house about their ears, they fill the cavities as they advance with clay, which soon becomes hard as stone. Mr. Forbes remarks, that in his house at Tobago, he observed one day, that the glasses of some pictures were dull and the frames dusty. On attempting to wipe them, he found that the frames were plastered firmly to the wall by this sort of mortar : the ants having eaten the frames, back boards, and most of the paper, leaving nothing but the prints and the gilding ; thinking, perhaps, that as the latter might be of some use to him, and could be of none to them, it was but just to spare them. They are as adroit in constructing their own habitations, as in destroying those of man. They raise hills ten or twelve feet high, a work almost incredible for a creature not more than a quarter of an inch long. The royal chamber is in the centre, and other cells and galleries are gradually multiplied around it. The whole fabric is so well constructed, that the wild bulls sometimes make use of them for the purpose of observatories, and find them strong enough to bear their weight. If any one attack their habitation, they are at once ready to do battle. Smith gives us his opinion of their warlike power. He says, that he one day attempted to knock off the top of one of the hills. The insects within, hearing the noise, came out to see what was the matter, upon which he took to his heels and ran away as fast as he could. They have been known to attack an English ship of the line, and capture it by boarding ; it is said, that the palace of the English Governor-General in Calcutta is perishing under their operations. The insects, perhaps, like some other people, have never been able to see distinctly the right by which he governs in their country ; in superstitious times, this would be thought prophetic of the fate which awaits the British empire in India in some future day.

The locusts have been dreaded from the earliest time, as appears from the Hebrew prophecies and the profane historical writings. We have authentic and particular accounts of these visitations in modern times. One of the most alarming was in Russia, in 1650. They entered it at three different points, and thence spread over the neighboring countries in such numbers, that the trees bent with their weight ; they destroyed every thing, and when they died, they were found lying in many places to the depth of several feet upon the ground. Dr. Shaw, in his travels in the Levant, was a witness to one of their invasions. In April, their numbers darkened the sun. In June, after their breeding time was over, they re-appeared, recruited by their young, in compact bodies of several hundred yards square, and marched forward, taking possession of gardens, trees and houses, devouring every green thing. The inhabitants dug trenches, which they filled with water, and kindled large fires ; but the fires were extinguished, and the trenches filled with carcasses. A day or two after these had passed, another division passed over the same ground, and finding no other food, ate the young branches and the bark of the trees. Nothing comes amiss to them ; if they cannot supply themselves with the fruits of the garden, they will feed on the thorn-apple and the deadly night-shade. The lord of the creation finds his sovereignty a very empty distinction, when his title is disputed by such things as this.

The ingenuity displayed by insects in various operations is truly wonderful, and certainly puts the large beasts to shame. The most momentous of these with them, as with man, is the construction of a habitation. Every one knows the skill of the common bee and wasp, in geometry and architecture ; but however it may have been with naturalists, it was not generally known that the solitary species, who labor without the advantages of counsel and mutual aid, were able to produce such results in the form of masonry, caverns and arbors. Mr. Rennie gives most interesting information on this subject, for which we are indebted to his own observations. He has seen a mason-wasp scooping out a gallery in a brick, by gradually removing particles with her jaws, which serve her both as trowel and chisel ; lest the chips should betray her retreat, she carefully removed them where the ichneumon fly, which minds every insect's business except its own, should find no clue to her eggs. When the excavation was completed, the

eggs deposited, and some caterpillars placed in it to serve as food for the young when hatched, the wasp departed, well satisfied with the results of its labors. He gives an account equally pleasing, of the work of the mason-bee. In May, 1829, he discovered the bank which supplied all the mason-bees in the neighborhood with their mortar. It was a brown clay, in which was a hole which the bees were constantly entering, and from which each returned laden with a bit of clay. On arresting one of the bees, he found that the clay had been moistened and kneaded; it did not take more than half a minute to prepare its hod, and the dryness of the air was such, that in order to make their work hold together, they were obliged to work as if it were a matter of life and death, at the rate of fourteen or fifteen hours a day. He traced one of them to her nest on the inner wall of a coal-house of roughly finished brick, where she was building upon an upright crevice from which the mortar had fallen. While working at the bank, she was perfectly unconcerned; but here she had an air of great mystery and reserve, as if afraid of betraying her retreat to marauders. When she thought herself observed, she pretended to be busy about something else, prying most intently into some other crevices of the building. This bee did not use lime in her mortar, according to the usual practice of the race. When cells were made and eggs deposited, with a quantity of pollen for food, the bee left the young to take care of themselves.

Another curious race bear the name of carpenters, and deserve it from the magnitude and excellence of their works, made with no better tool than their jaws, which answer the purpose of chisel, plane, and key-hole saw. The male seems, like many human animals, to go to places of public resort, while the female pursues her manifold and solitary labors. This bee also carries away its chips, and varies its flight so as to mislead any insect spy. She first makes a tunnel in the wood, beginning in an oblique, which is soon changed to a perpendicular direction; at the bottom of the excavation she deposits an egg, with provision for its future support, and then covers it with a ceiling of cemented sawdust, which serves as floor to the chamber above. This floor is made by concentric circles gradually closing toward the centre, and after having completed several chambers, she uses the same material to form the outer door. It occurs to the

bee, that the egg first laid will be first hatched, and the young have no means of escape, except through all the rest of the chambers. In order to obviate this difficulty, she is at the trouble of making lateral openings to the bottom of each chamber, through which each young one may retire without disturbing the order of the family. Can such things be?

Equal skill and even more taste are displayed by a kind of bee, to which has been given the name of upholsterer. Its young, if, like grubs in general, they are blind, cannot be very particular as to the decorations of their lodging; still the parent gratifies her own affection, by lining it with the richest materials which the season affords. She digs an excavation two or three inches deep, and polishes the wall to prepare it for the tapestry. The poppy-bee makes use of the scarlet petals of the flower from which she is named; she cuts out pieces in an oval shape, and afterwards cuts them, if necessary, to suit the place they are intended to fill. It is no easy matter for human hands to cut a poppy-leaf without its shrivelling; but this presents no difficulty to the more delicate instruments of the bee. It is a question with naturalists, whether the bee is induced to select this flower by a regard for the beauty of its color, or some perception of its properties which we are not acquainted with; so long, however, as the bees themselves are silent on the subject, there is little hope that the question can be satisfactorily decided. The leaf-cutter bee belongs to the same craft, and though it works entirely by rule of thumb, shears its circular pattern from the leaf of the rose and other plants with marvellous precision; in fitting it to the wall of her nest, she employs no paste, but trusts to the spring of the leaf to retain it in its position. It would seem as if, on comparing notes, it would be found that the bee can learn less from man than man from the bee. Many of these creatures are as remarkable for fierceness as for industry. Mr. Rennie mentions that he once attempted to examine a nest of lapidary bees, but was prevented by the warlike owners, who, not satisfied with repelling the invasion, chased him a quarter of a mile.

We said that man might learn from insects; but we are not sure that human skill would be adequate, even to an imitation of many of their inventions. Still it seems very probable, as Mr. Rennie suggested, that if men had studied under insects, many improvements, which have been brought to their present perfection by the efforts of successive ages, would have been

completed long ago. The wasp has always made the paper from which it constructs its nest, by uniting vegetable fibres with glue, while man was vexing himself with attempts to write on the bark of trees or a waxen or metallic table. But the ancient naturalists were not sufficiently close observers; they doubtless saw the operations of the mason-bee, but so far from suspecting what it was doing, they supposed it to be carrying the bits of stone and clay as ballast, to steady itself against the wind. They were acquainted with the musical powers of the cicadaë, but not with their mechanical furniture. The instrument, with which the female,—the male being the musician,—pierces the vegetable to insert its eggs, is composed of three pieces, the two outer ones being saws with teeth, the inner pointed like a lancet. The denticulated pieces are capable of being drawn forward and backward like a saw, while the inner one is stationary, and at the same time they are united together in one. The saws, or files, as Réaumur calls them, have grooves in them, which receive a projecting part of the central piece or lancet, on which they slide up and down. The saw-fly has an instrument still more curious, for sawing a hole into the wood; it consists of two equal and similar saws, sliding upon each other, which it works at the same time, the one being drawn back, while the other is pushed forward; these are inserted in one back, which also contains a passage through which the eggs are passed into the hole cut to receive them. The teeth of these saws are themselves denticulated with fine teeth, so as to combine the properties of a saw and a file. If we could imagine a carpenter, with a saw composed of two plates sliding upon each other, cutting at the same time in the same course, and moved, the one forward, the other back, by the same motion of his hand, we can easily conceive that he would bless his stars for such an invention.

Some insects enjoy a perpetual feast of tabernacles, after the manner of the Jews. They roll a leaf in such a manner as to protect them from other insects and the elements, and to furnish them with board and lodging at the same time; and though the appearance of our trees and shrubberies is not improved by their proceedings, we cannot help admiring the skill and industry they manifest in their constructions. Some insects, disgusted with the insecurity of life and property on earth, deposit their eggs, so that their young may first see the light under water; the grubs provide a lodging with leaves, straws, or bits

of stone. Some disguise their cocoons by an outer covering, so much resembling the soil or leaves, that no animal sagacity can detect them. The moths which make havoc among clothes, finding their way to them through cracks and key-holes, provide for their young, at our expense, a lodging of a most comfortable description, from which they cannot be easily removed; camphor and similar articles being regarded by them with the utmost unconcern. Mr. Rennie took one from the carcase of that moth, which bears the respectable name of 'old lady,' and placed it on the green cloth of a desk, where its proceedings were under his eye. It cut a hair near the cloth, and after placing it in a line with its body, cut another, which it laid parallel to the former, binding them together with silk, and so on, till it had made a covering large enough for its body; this was made large enough also to admit of its turning round in it, and when finished, was lined with silk, an article in which insects are large dealers. As the caterpillar increases, it adds to its covering at either end; but it increases in thickness also, and in order to make room, it slits the case half way down on each side, and fills up the space with a patch; then proceeds to enlarge the whole length in the same systematic and deliberate way. Réaumur says, that they never will leave their dwelling for another; but Mr. Rennie says, that in case they are molested, they fling away in a passion. The very individual whose history has been alluded to, took up its habitation in a 'ghost moth,' but either from resentment at being disturbed, or from fear of ghosts, it adjourned to the 'old lady.'

Nothing, however, exceeds the habitation of the mason-spider, of which there are several kinds. One of them bores a hole in the ground two feet long and half an inch broad, a work, which, considering that it is executed by a single spider, without pickaxe or shovel, is very far beyond the rail-road tunnels of England. This tube is delicately lined with silk, and is closed with a trap-door, suspended by a silk hinge, and fitting close in a sort of case or groove, like the doors of our houses, the inner side being perfectly smooth, and the outside rough like the rest of the bank, in the side of which this horizontal gallery is made, in order that no external appearance may betray it. This door is a perfect circle, though the insect is as ill provided with mathematical instruments as certain bucket-makers of our country, concerning whom tradition says, that they had no means of describing a circle, except by

holding up their board before the moon when at the full. The spider makes its home at the further end, and carries lines of silk, which give notice when any stranger is at the door. When this is the case, the spider runs to the door, not however to invite the stranger in, but to fasten the door against him, which he does by bracing himself against the wall, and holding the door with both hands. Mr. Rennie had the nest of a mason-spider, not of the same kind, sent him from the West Indies. It had a door of the size of a crown-piece, slightly concave on the outside and curved within, formed by several layers of the same kind of tapestry which lines the interior, the inner layers being the broadest and the outer less in diameter, except toward the hinge, which is about an inch long. The elasticity of the materials gives the door the property of acting like a spring, and shutting of its own accord. The door fits in an aperture of the same material, and so accurately, that when shut, it is difficult to discover by the sight where it is. A door of elastic materials, closing in this way by a spring, is a contrivance which must make the best mechanic that ever lived acknowledge, that in this respect the spider is his master.

The same ingenuity which governs insects in the construction of their dwellings, is also manifested in their provision for the wants and happiness of their young. Their instinct acts here with almost unerring precision; there are cases in which an insect occasionally casts a figure incorrectly, but such cases are few. The butterfly draws its support from flowers; but knowing that such provision would never do for its young, it deposits the egg on such plants as will afford support to the grub, and before doing so, generally takes pains to ascertain that no other has forestalled it. The moschetto and dragon-fly, though it would be as much as their lives are worth to go in the water themselves, deposit their eggs in it for the benefit of their young. The gad-fly, whose young are first to see the light, figuratively speaking, in the stomach of a horse, manifests much address in effecting its purpose; it flies round the horse, and balancing on its wings, glues its eggs to his hair, amounting to some hundreds in all. They are hatched by the least warm moisture. When the horse licks the place, he conveys many of the grubs to his mouth and swallows them, already hatched by contact with his tongue. It may be observed, that the fly chooses the knee and shoulder, as places

where the horse is most likely to reach them. The ichneumon fly lays its egg in the body of a caterpillar; and the young, when hatched, feed upon it; but with prudence exceeding its humanity, the grub avoids the vital parts, and carefully keeps the caterpillar alive till it has no further use for it. An insect which deserves to be better known, was seen by Ray, dragging a green caterpillar to a hole it had dug in the sand. After removing a pellet which closed the mouth of the hole, the insect went down into the grave, and drew the caterpillar in. When it came up again, it rolled in bits of earth, scratched in the earth with its fore-feet, then went to a pine tree for resin to seal it, and having arranged every thing so as to conceal the entrance, it took two pine-leaves and laid them in a particular manner, so that it might know the spot again. Every one knows the perseverance with which a common beetle rolls little balls to the distance of several feet, that they may fall into holes which they have prepared for the residence of their young. They work in a way, which, however it might be with man, is the most effectual that they can employ, by supporting themselves against the ground and trundling it onward with their hind-feet; the ancients observed this proceeding, and believed that the insects did it by way of exercise and recreation; though it would evidently have been easy to find some pleasanter sport. Some insects, not distinguished for ingenuity in providing for their young, supply the defect by extreme personal attention; such as the much-injured earwig, which takes example from the hen, and superintends her young with equal assiduity, marching before them with motherly dignity and affection. The spider carries about its eggs in a silk bag, which it defends with as much fury as if it contained money; it will not give them up, but with the last drop of its blood. The wasps, though perfect Ishmaelites as to all the rest of the world, are courteous and civil in their intercourse with each other, and so affectionately devoted to their young, that they will not forsake them even when their nest is torn to pieces. Ants, when disturbed, may be seen carrying little white bodies to a place of safety, and so intent are they upon their work, that even when cut in two, they will not give it over. These are the eggs, which, as soon as hatched, are taken care of by the workers, which move them about according as they require to be warm or cold, wet or dry. An hour before sunset, they remove them to the lower cells, to keep them warmer, and bring

them up again every morning. If the weather-wise think it likely to rain, they do not remove them. As soon as the sun in the morning shines on the nest, the ants at the top go below and strike those in the lower stories to wake them ; being no strangers to the benefit of early rising, they carry the young into the sun for a quarter of an hour, and then place them in the shade. The humble-bee also, a good-natured creature, though not so distinguished for ability as other bees, is even more devoted to its young.

Though insects exert great address in favor of their young, they display equal resources when acting for themselves. They are tolerably well secured by nature, which has made it next to an impossibility to kill them ; nature also has provided them with means of escape and resistance. Many insects take the color of the earth or plant on which they happen to be, and, as any one may observe in the case of the privet-moth, though the caterpillar is several inches in length, a person might repeatedly look at the plant without detecting it. Some resemble dried leaves, and in that way elude the sharp eye of the bird. There are some which get their living by their wits, sometimes exerting them in an honest manner, at others, as thieves and robbers. Huber remarks, that a party of hive-bees went to the residence of certain humble-bees, to beg or steal, as the case might be. The humble-bees acted the part of Samaritans, believing that the knaves were poor and helpless, and for three weeks actually supported their lazy guests. This matter came to the ear of some neighboring wasps, who thought this a very pleasant way of supporting life, and therefore went to the nest and joined the party. The humble-bees were willing to do in charity all that bee could do ; but thinking this addition to their poor-rates intolerable, they determined, rather than have any quarrel, to give up their nest, and accordingly departed in peace. It is not uncommon for bees which have been badly managed, to fall into bad habits, and at last to take to the highway. Some of them are called corsairs, on account of this practice. Several of them will sometimes stop a bee which is engaged in its honest calling ; one seizes one leg, and another the other, while a third takes it by the throat, and calls upon it to stand and deliver its honey. When they have rifled it they let it go. Sometimes these pirates form an expedition, to take some neighboring hive by storm. The garrison resists valiantly, but should their queen be killed in

the battle, they think it useless to contend any longer, so they lay down their arms, and all unite and plunder the cells in the most harmonious manner. Nothing human exceeds the fierceness of an angry bee. One writer recommends giving brandy mixed with honey to bees, to sustain them under such an invasion; while others say, that such pot-valiancy would no more help their fighting than their morals. What their success in war is, may be learned from the story of a clergyman, as related by Kirby and Spence. His house was attacked by a mob, with which he vainly endeavored to reason. Finding that they were proceeding to acts of violence, he ordered his bee-hives to be thrown among them; the bees fought like lions, and soon cleared the field.

There are some ants, who have great aversion to labor; and in order to avoid the necessity of supporting themselves, they compel others to support them. This, however, it should be remarked, is not in this country, but in Europe; here, all know, that ants, as well as men, are born free and equal. The ant that carries on this trade, which is regarded as piracy by all civilized insects, is called the legionary,—a name descriptive of its military habits; the race which it reduces to bondage, is a sort of negro. The legionaries march against a settlement of the black ants, take it by storm, and carry away their prisoners. The old ants they do not touch; they prefer the young, whom they carry to their own home, and then train them to menial services of all descriptions. The natural consequence follows. They become too indolent and proud to work, and would starve were it not for their slaves, thus creating the necessity, by which probably they would justify the practice. They do not lord it over their negroes; on the contrary, they treat them with great kindness and even respect; the slaves are on the same footing as our slaves were formerly in New England, where they used to sit at table with the farmers, give their advice like oracles, and henpeck their owners in such a manner, that it was a relief to have them set free. We trust that no one will use these accounts, now so unquestionably proved to be true, to show, that the relation of slavery is not unnatural; the argument is no stronger than that in favor of royal government drawn from the practice of the bees, and employed by those, who overlook the fact, that a state of civil society may do well enough for bees, without being adequate to the wants and improvement of man. There are other

respects, in which these insects may well be quoted as an example. Thus we are told by Huber, that the female ants, when they become mothers of a family, cut off their wings and throw them away, thinking, doubtless, that domestic cares and duties will leave them no time to fly round as in former days.

No creature displays greater talent in providing for his own subsistence than the ant-lion, an insect which is particularly fond of ants, but has neither strength to master them in a fair field, nor fleetness to run them down. Indeed its means of progression are very unfavorable to the chase, as it can only move backwards, and that with a halting gait; its appearance is so uninviting, that other insects think twice before they go near it; it will eat no meat, except what it has slaughtered with its own hands. With this fastidiousness and these disabilities, one would say, that the creature had a reasonable prospect of starving to death. This, however, is not his opinion; he knows that stratagem is sometimes an overmatch for strength; he therefore selects a place where he may construct a pitfall for a trap, generally choosing a loose soil, which can be excavated with least trouble. The way in which he goes to work is entirely his own. He first describes a circle, to mark the rim of his pit; then placing himself on the inside of this circular furrow, he pushes himself backward under the sand, making the hind part of his body serve as a plough-share; then using his fore-leg for a shovel, he heaps a load of earth upon his head, which is flat and square; then giving his head a jerk, he tosses the earth to the distance of several inches. Thus he goes round the circle; then he marks and shovels out another furrow inside the former, and so on till he reaches the centre of the circle. In order that the whole burden may not come upon one leg, when he has finished one furrow, he proceeds with the next in an opposite direction. Should he come to a bit of gravel, he lays it on his head, and flings it out; should the stone be too large, he shoulders it and carries it on his back up the sloping side of the pit; if this cannot be done, he either leaves the pit or works the stone into the wall. The pit, when completed, is conical, sloping down to a point, where the ant-lion takes his station, and in order that other insects may not suspect his object, covers himself with sand. When idle and thoughtless insects see this pit, they must needs look in, to see what it is and what it is for; but as they indulge their curiosity, the sand gives way under them and down they

go. If they attempt to escape by climbing the side, it yields beneath their feet, and the ant-lion beneath pelts them with sand in such a manner, as soon to put an end to their endeavors; having fed upon his prey, the ant-lion, in order to save his reputation, throws the skin to a considerable distance. After having led this life for two years, the ant-lion is promoted to the rank of a fly.

The English naturalists have noticed a kind of spider, which, having observed that many insects fall into the water, thinks that his best harvest is there; but nature has neither formed him for swimming, nor provided him with shipping. He does what man would do in a similar case. He collects materials on the shore to form a raft, ties them together with silken strings, and pushing off from the shore, sails out to relieve any insect that may happen to be drowning, not, as may well be supposed, from motives of pure humanity, but rather of that mixed kind which enters so largely into most actions in this world. What ideas insects have upon the subject of social rights and claims, we do not know. They are active enough in relieving each other while living; but let an unfortunate insect be taken sick, and they gather about him and put him out of his pain. Whether they think that if he must die, the sooner the better, or whether this is the means which nature has provided for shortening the agony of death, it is upon the whole a benefit to those which are subjects of the operation. The female bees make a general massacre of the drones; wasps, on the approach of winter, as they do not make any provision against the evils of cold and hunger, murder their young, on Sancho's principle, that there is no pain so great which death cannot end. Some suppose that insects and other animals do not suffer as we do from such an operation; the main reason upon which they support the theory is the cheerfulness with which the insects submit to it; but this may arise from other causes; besides, they are not in the habit of expressing their feelings. It will be better for the sake of humanity, to go on the presumption that they suffer, because the doubts upon the subject are not easily removed.

The motions of insects are very curious, and some of them have occasioned much controversy and speculation. Apodous larvæ have no occasion to take long journeys, their business confines them at home; they therefore make their way slowly, by gliding, jumping or swimming, ways sufficiently rapid for

their purpose. The motion of serpents, in old time was accounted very mysterious ; no one could tell how they moved so rapidly, without any visible means of walking, and this was among the reasons which gained for them so much reverence in ancient times. Sir Everard Home at last discovered, that the points of their ribs were curiously constructed for the purpose ; and in the same way it is probable that many things of the kind, which are now incomprehensible, will appear to be very simple. Some move by contracting the segments of their bodies ; others, like the larvæ of flies, drag themselves by hooks in the head, an operation as inconvenient as if a man should drag himself on the ground by his chin ; cheese-maggots fix their mandibles in places on the table, and let them go with a jerk which sends them to a marvellous distance. Caterpillars climb very readily, but for security carry a ladder of ropes as they go, sticking it to glass or any substance, however hard and smooth, on which they happen to be ascending. They often have occasion to descend from branch to branch ; sometimes they are shaken by the wind or thrown with violence to the ground, in which case they take their rope with them, and by means of it re-ascend the tree. So when they travel round the tree, they need a clue to conduct them back to the nest. When they move, they reach forward their necks as far as possible, fasten the thread, then bring up their body and take another step, a movement which may be seen in the canker-worm of our orchards. When they descend, they have power to contract the orifice through which they send out their thread, so as to let themselves gradually down. In climbing on the line, the caterpillar catches the thread as high as it can reach, pulls up its body, grasps the thread with its hindmost legs, and thus regains the tree from which it had fallen. When it has thus ascended, it is found to have a little ball of thread.

The motion of flies was long a subject of debate and wonder ; some thought that they must have claws, others that they had glutinous sponges, an appendage which would not allow of rapid motion. Hooke was the first to observe, that some curious mechanism must be employed, but what it was he could not discover ; he thought it might be something resembling card-teeth, set opposite to each other, by which they could grapple some projecting places, such as they might find on the smoothest surfaces. Durham thought it not unlikely that they stuck, as boys lift a lap-stone by a piece of wet leather attached to

the top ; an explanation which amounted to nothing more than a confession of ignorance ; since, though it might show how a fly could stick to a wall, the object was to show how they move on the wall. Sir Everard Home at last discovered, that it was done by producing a vacuum between the surface on which they walk and parts of the foot constructed for that purpose. There are two suckers connected with the last joint of the tarsus, and a narrow neck which moves in all directions, under the root of each claw. These suckers consist of a contractile membrane, which adapts itself to any surface. Had it been possible for the fly to communicate with men, the air-pump of Guericke, and possibly our countryman Dr. Prince's improvement upon it, might have been known to the world much sooner after it was created. There is a water-spider, also, which invented the diving-bell and has used it to more purpose than men. It spins a shell of closely woven white silk, in the form of half a pigeon's egg, which forms the diving-bell. This is sometimes under, sometimes partly above the surface of the water, and is lashed by threads to whatever happens to be near. It is closed all round except an opening below. By this contrivance, the spider carries air with it down to its submarine nest. To complete the catalogue of mathematical instruments, it is well known, that the gossamer spider ascends high into the air with its light thread, on the principle of the balloon.

The movement of spiders in the air has always been regarded as a difficult matter to explain. Dr. Lister, the celebrated English naturalist, whose researches into the habits of spiders discovered almost all that is now known, believed that they had the power of shooting out threads in the direction in which they wished to go. Kirby also used the same language, speaking of the spider 'shooting out his threads,' not from carelessness of expression, but evidently meaning to be literally understood. White of Selborne gives the same account of the spider. This certainly is a great weight of authority in favor of this power in the spider ; but it is so unlike every thing with which we are acquainted, that we are naturally suspicious of some mistake, and we are glad to see that Mr. Rennie will not allow, that the spider has a gift so much beyond the usual order of nature. There are those of no small pretensions as naturalists, who believe that the floating of the spider's thread is electrical, and maintain that it can dart its thread in the wind's eye. Whoever hastily observes them will be of the same opinion, with

respect to the gossamer spider and some others. Within a few days, standing in a shed, we saw a line of very small spiders coming down perpendicularly from the wall, each being apparently attached to a large thread by a smaller thread of its own. There were perhaps a hundred in the string. After having descended about eight or ten feet, the lowest came opposite to a door, where a light air was blowing in, and turned off in a direction almost horizontal towards the door. On looking very closely, we could discover no line beyond the leading spider, but on striking the hand between him and the wall, he immediately fell into the perpendicular again. It is difficult to believe that spiders have sufficient projectile force to dart out a thread of such a material to any considerable distance, and the general opinion now is, that they depend wholly upon the lightness of their thread and the agitation of the air.

In the *Insect Miscellanies*, Mr. Rennie discusses some curious subjects connected with insects, which were not embraced in the design of his former works. One is, the manner in which insects are guided in their flight, not so much by their sight, as by the delicate nerves of their wings; in this power resembling bats, which, as is proved by some humane experiments, can find their way as well without eyes as with them. Another is the sensibility of insects to changes of temperature. Mr. Rennie does not seem to think very highly of their observations of the weather. We had supposed that they equalled the most nervous invalid in their sensibility; ants are known to secure their eggs against the rain, and there seems to be no reason, why spiders should not be equally accurate observers. There are flowers which foretell such changes, and if such presages are necessary to the existence of the insect, doubtless their instinct supplies them. They probably are not much acquainted with causes and effects; but instinct is the direct agency of a power which is not limited in its capacities. It is no acquaintance with the principles which govern the ordnance department, which induces the insect called the bombardier to discharge its artillery upon any insect which pursues it; it is frequently chased by other insects, and instead of retreating, it waits till they come within point-blank shot, and then discharges its field-piece with a noise and smoke which to insects are truly alarming. In this way it will fire as many as twenty rounds, and when its ammunition is exhausted, if the pursuer is not repelled, the gunner will retreat to a shelter, retiring, not with alarm, but with a very imposing front, like the Americans at Bunker Hill.

Mr. Rennie adds to the curious particulars already known, concerning the manner in which grasshoppers produce and increase their sound. They apply the hind shank to the thigh, rubbing it smartly against the wing-case, and alternately the right and left legs. This fiddling, however, would not be heard at any great distance, were it not for a sort of drum at their side, which is formed with membranes suited to increase and echo the sound. The instrument upon which the male cricket plays,—for, unlike the usual order of nature, the female is silent,—is a pair of rough strings in the wing-cases, which they rub against each other. White of Selborne endeavored to naturalize field crickets near his house, and Mr. Rennie to introduce house crickets to his hearth; both were unsuccessful, the insects probably having doubts whether their first welcome would ripen into lasting hospitality.

These are certainly very interesting works, and do credit to the Library of Entertaining Knowledge, of which they form a part, as well as to the ability of Mr. Rennie, as a naturalist and a writer. We do not expect sudden nor striking effects from thus multiplying works of popular instruction, but when they are sown broad-cast, as they are in the present day, some will take root, and produce harvests which the world does not know. To supply means of happiness,—to inspire a taste and talent for observation,—to teach men to pass through the world, not as strangers, but as interested to know every thing about them, though it may not be so splendid a service as many other scientific exertions, is certainly the one which will give the philosopher his most enviable and enduring fame.

ART. X.—*Bigelow's Travels in Malta and Sicily.*

Travels in Malta and Sicily, with Sketches of Gibraltar, in Eighteen Hundred and Twenty-Seven. By ANDREW BIGELOW, Author of 'Leaves from a Journal in North Britain and Ireland.' Boston. 1832.

It is well observed by Pliny, that history, however written, is always delightful. *Historia, quoque modo scripta, delectat.* The same remark may be applied to travels; and it may be added with regard to both these classes of works, that they are always instructive. They are the true antidote to the mass of